

## Spermophilus adocetus. By Troy L. Best

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### *Spermophilus adocetus* (Merriam, 1903)

#### Lesser Tropical Ground Squirrel

*Citellus adocetus* Merriam, 1903:79. Type locality "La Salada, 40 miles south of Uruapan, Michoacán, Mexico."

**CONTEXT AND CONTENT.** Order Rodentia, Suborder Sciurognathi, Family Sciuridae, Subfamily Sciurinae, Genus *Spermophilus*, Subgenus *Otospermophilus*. The genus *Spermophilus* contains 38 species (Wilson and Reeder, 1993). Two subspecies of *S. adocetus* are recognized (Hall, 1981):

*S. a. adocetus* (Merriam, 1903:79), see above (*arceliae* Villa R. is a synonym).

*S. a. infernatus* Alvarez and Ramírez-Pulido, 1968:183. Type locality "14 km al norte de El Infiernillo, Michoacán [31 km. N, 19 km. E Pizandarán—Hall, 1981:404]," Mexico.

**DIAGNOSIS.** Congeners that approach the range of *S. adocetus* (Fig. 1) are *S. annulatus*, *S. mexicanus*, and *S. variegatus*. *S. adocetus* resembles *S. annulatus* (total length, 383-470 mm), but *S. adocetus* is smaller (total length, 315-353 mm), paler (less reddish), the tail has no annulations, the rostrum is shorter and wider, and the interorbital region averages 49% instead of 45% of the zygomatic breadth (Hall, 1981; Howell, 1938). Compared with that of *S. annulatus*, the skull of *S. adocetus* (Fig. 2) is smaller, the jugal is broader, and the coronoid and angular processes of the jaw are longer (Merriam, 1903).

Compared with *S. mexicanus* (total length, 280-380 mm), which usually has nearly square white spots arranged in about nine longitudinal rows on the dorsum, *S. adocetus* is larger and has no dorsal stripes. Compared with *S. variegatus*, *S. adocetus* has a closed supraorbital foramen and the sides of the head are tawny or buffy (Hall, 1981).

**GENERAL CHARACTERS.** The pelage of the lesser tropical ground squirrel is hispid, the ears are short, and the tail is long. The pelage is uniformly grizzled grayish or buffy without markings. The upperparts are strongly grizzled grayish-black, changing with season to dull ochraceous-brown. The top of the head usually is darker (blackish in some individuals) than the upperparts. The stripe from the side of the nose passing over the eye is pale buffy, sometimes washed with or bordered above by pale fulvous. There is a short band under the eye (rarely reaching to the ear) that is buffy. The cheeks are grizzled and washed with fulvous. The underparts are buffy or yellowish buffy, sometimes becoming fulvous on the throat and chin. The forelegs and feet and the hind feet are dull pale-fulvous; the fulvous in the brown pelage extends over the thighs. The sides of the neck are washed with fulvous. The tail is coarsely grizzled black and buffy, bordered on the terminal one-half with a subapical black band and edged with buffy fulvous. The median line of the distal one-half of the underside of the tail usually is pale fulvous (Merriam, 1903). The tail does not have annulations as in *S. annulatus* (Howell, 1938).

There is no secondary sexual dimorphism in size (Villa-Ramírez et al., 1991), but there is considerable variation among individuals in size of skull (Howell, 1938). Averages and ranges of external and cranial measurements (in mm) of *S. a. adocetus* from 4 km S Arcelia, Guerrero, and 2 km SE Apatzingán, Michoacán, and of *S. a. infernatus* from 14 km N El Infiernillo, Michoacán, respectively, are: total length, 332 (286-366), 325 (244-355), 299 (288-318); length of tail, 154 (145-163), 146 (120-160), 130 (112-145); length of hind foot, 45 (41-50), 44 (40-47), 41 (38-42); length of ear, 17 (16-18), 15 (14-16), 16 (14-20); greatest length of cranium, 45.5 (43.2-47.7), 45.9 (44.1-48.0), 42.4 (40.0-44.0);

condylobasal length, 43.3 (41.4-45.9), 43.1 (41.3-45.4), 39.7 (37.4-41.5); zygomatic breadth, 26.0 (24.6-27.3), 26.1 (24.7-27.8), 24.2 (23.4-25.1); breadth of braincase, 20.0 (19.8-20.7), 20.1 (19.1-21.6), 18.5 (17.8-19.0); interorbital breadth, 12.2 (11.1-13.1), 12.9 (11.3-13.9), 11.9 (11.5-13.0); postorbital breadth, 13.0 (12.4-14.0), 13.4 (11.9-14.2), 12.6 (12.0-13.1); nasal length, 14.0 (13.1-14.9), 14.6 (13.6-16.4), 12.3 (11.1-13.7); length of maxillary toothrow, 8.8 (8.3-9.4), 8.9 (8.5-9.5), 8.2 (7.5-8.7); length of auditory bullae, 10.5 (10.0-10.9), 10.3 (9.8-11.0), 9.9 (9.3-10.6—Alvarez and Ramírez-Pulido, 1968). A male and a female from Michoacán had a mass of 163.5 and 181.5 g, respectively (Alvarez et al., 1987).

**DISTRIBUTION.** The lesser tropical ground squirrel occurs in the Mexican states of Distrito Federal, Guerrero, Hidalgo, Jalisco, México, Michoacán, and Tlaxcala (Fig. 3; Hall, 1981; Villa-Ramírez et al., 1991). Most of the range of *S. adocetus* is in the Trans-Mexican neovolcanic belt (Fa and Morales, 1991), where it occupies the tropical life zone (Howell, 1938) and the more arid areas on the Mexican Plateau up to 3,000 m elevation (Villa-Ramírez et al., 1991). The record from Tlaxcala is unusual and may represent animals that were transported to that area to be sold as pets (G. Ceballos, in litt.).

**FOSSIL RECORD.** The genus *Spermophilus* evolved by the middle Miocene and is common in Blancan (late Pliocene) faunas (E. Anderson, in litt.; Black, 1972). No fossils of *S. adocetus* are known.



FIG. 1. An adult male *Spermophilus adocetus infernatus* near El Infiernillo, Michoacán, Mexico.

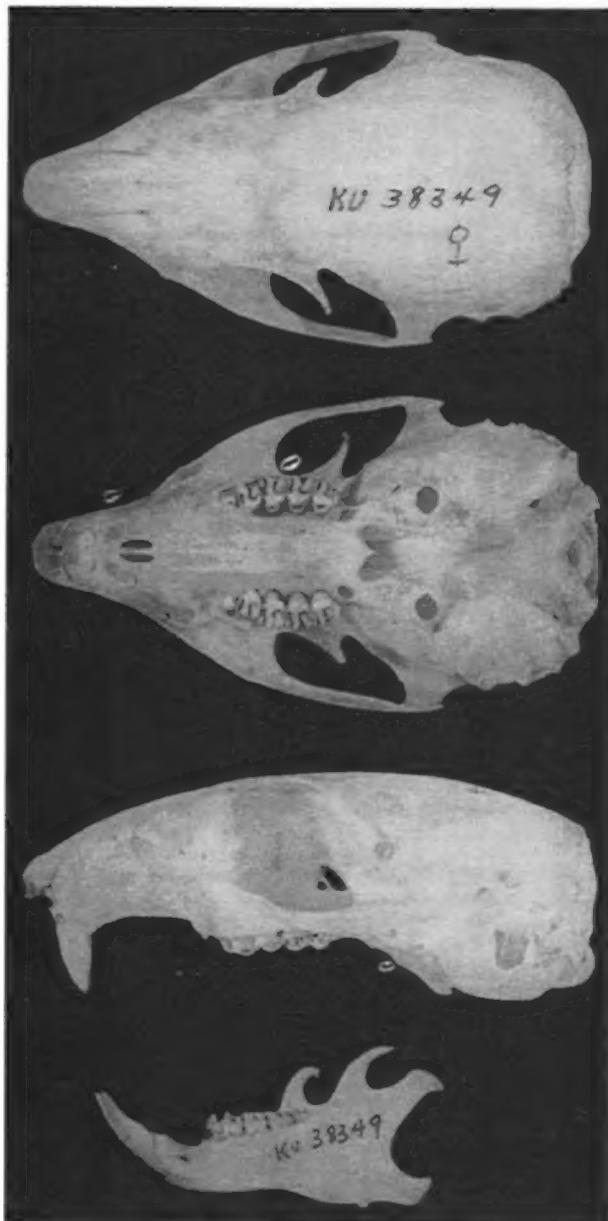


FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of *Spermophilus adocetus* from 14.4 km S Lombardia, 450 m elevation, Michoacán, Mexico (female, University of Kansas Museum of Natural History 38349). Greatest length of cranium is 45.6 mm.

**FORM AND FUNCTION.** The dental formula of *S. adocetus* is  $i\ 1/1, c\ 0/0, p\ 2/1, m\ 3/3$ , total 22 (Hall, 1981). The upper incisors are stout and recurved (Howell, 1938). The hyoid apparatus consists of a single basihyal and paired thyrohyals, ceratohyals, and stylohyals; the basihyal is round in cross-section and fuses with the long thyrohyals at an early age (Hoffmeister and Hoffmeister, 1991).

The baubellum (Fig. 4) is cartilaginous, and has a well-developed disc that is symmetrical, more or less fan-shaped, and equipped with evenly spaced teeth along the margin. Compared to *Ammospermophilus leucurus*, which has a similar baubellum, that of *S. adocetus* has the disc relatively smaller, less expanded, set at a lesser angle to the axis of the shaft, and more deeply concave on the dorsal surface. The shaft is straight with the proximal end widened in lateral view and possessing three projections at the extreme base and a fourth slightly distad. The length is 3.0 mm and the greatest width of the disc is 1.3 mm (Layne, 1954). Nothing is known regarding the ontogeny and reproduction of the lesser tropical ground

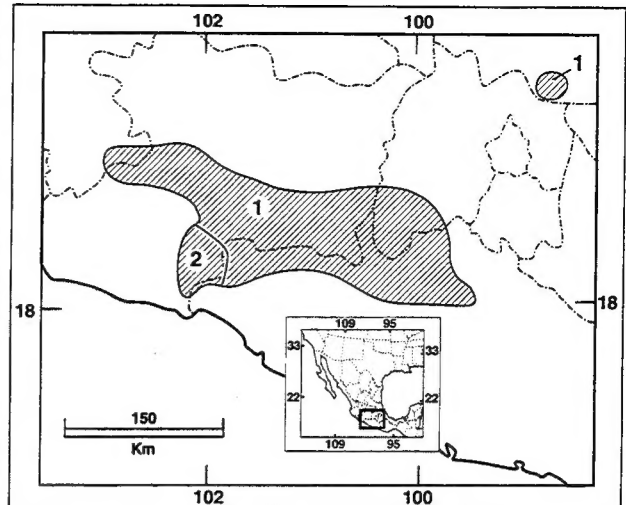


FIG. 3. Distribution of *Spermophilus adocetus* in western Mexico (Hall, 1981): 1, *S. a. adocetus*; 2, *S. a. infernatus*. The record of this species from Tlaxcala is questionable, and may represent animals that were transported there to be sold as pets (C. Ceballos, in litt.).

squirrel, but it may reproduce throughout the year (C. Ceballos, in litt.).

**ECOLOGY.** *Spermophilus adocetus* lives in areas with xerophytic vegetation (e.g., *Cephalocereus hoppenstedtii* and *Prosopis*—Alvarez et al., 1987; Fig. 5), among rocks along canyon sides, about stone walls, corrals near ranches (Howell, 1938), and in agricultural areas (Villa R., 1943). The lesser tropical ground squirrel is common in parts of Michoacán (Alvarez et al., 1987) and in the valley of the Río Apaste, Jalisco. Mangos, bananas, and corn are cultivated in the valley, and adjacent hillsides support low tropical deciduous forest (Genoways and Jones, 1973).

The burrows of *S. adocetus* may be in open ground at the base of a tree or bush (Howell, 1938), in rocky areas along small ravines (Fig. 6), or under mesquite (*Prosopis juliflora*—Hall and Villa R., 1949). Near Arcelia, Guerrero, numerous burrows of *S. adocetus* were on the edge of a floodplain among rocks and shrubs (Villa R., 1942). At this locality, many burrows were located in rocky clay soil between or beneath stones, but burrows also were at the edges of arroyos, at the bases of shrubs, or in open fields. Usually, burrow entrances were horizontal, but some entrances were vertical to a depth of 40 cm (depending on the soil). Underground, the burrows were horizontal and branched one or more times. There also was an opening at the other end of the burrow. Burrows were

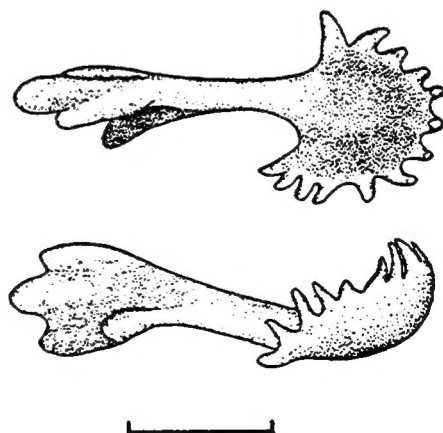


FIG. 4. Dorsal and right lateral views of the baubellum of *Spermophilus adocetus*. The scale represents 1 mm (modified from Layne, 1954).



FIG. 5. Habitat occupied by *Spermophilus adocetus infernatus* near El Infiernillo, Michoacán, Mexico.

noticeably circular in cross section, and within the burrows were spheroid expansions where the animals lived or where they built their nests (Villa R., 1943).

Near Arcelia, Guerrero, a burrow opening on the side of a small ravine had a mound of soil forming an irregular cone that was wide at the base. There were many such mounds of soil among the rocks and at the bases of shrubs. The mounds were the most visible sign of the burrows, although some burrows did not have the mounds because of weathering. At 45 cm into this burrow, there was a rounded and enlarged section of the tunnel, with nearly smooth walls, and the floor had no nest or food debris. There was another, rounded chamber 20 cm farther into the burrow where the burrow branched to a surface opening in one direction, and in the other branch there was a nest made of grass. The diameter of the burrow was 12 cm, the deepest part of the burrow was >60 cm below the surface, and the burrow was 1.9 m long. Another burrow at the edge of a fallow field, opened into a straight tunnel that was vertical to a depth of 40 cm; then the burrow became horizontal. After another 30 cm, the burrow widened into a rounded chamber, then continued another 60 cm to the surface. Because of the stones of an old fence, it was impossible to follow other branches of the burrow to the nest(s). The deepest place found in the burrow was ca. 40 cm, and the diameter was 12 cm. No food caches were found, but they may have existed (Villa R., 1943).

The lesser tropical ground squirrel is an omnivore, and has been observed in vegetation dominated by plants such as *Acacia cochliacanta*, *Acacia formosina*, *Prosopis juliflora*, *Crescentia alata*, *Pietecellobium*, and malvaceas, where it was eating seeds, fruits, or sprouts (Villa R., 1942; Villa-Ramírez et al., 1991). The dried and black seeds of *Crescentia alata* are an important part of the diet of *S. adocetus*, as well as the fruits of plum trees (*Prunus*), and the seeds of *Acacia farnesiana* and other plants (Villa R., 1943). In captivity, the lesser tropical ground squirrel eats corn, many kinds of fruits, lettuce, meat, tortillas, and bread (Villa R., 1942).



FIG. 6. Burrow occupied by *Spermophilus adocetus infernatus* in rocky habitat near El Infiernillo, Michoacán, Mexico.

*Spermophilus adocetus* may cause significant damage to cultivated crops, such as corn, beans, and sorghum. It is possible that *S. adocetus* has spread its range into the more arid habitats of the Mexican Plateau because of the large areas under cultivation. These agricultural areas provide food in the more arid parts of its range (Villa R., 1942; Villa-Ramírez et al., 1991).

The size of populations of the lesser tropical ground squirrel varies from year to year and among seasons (Villa R., 1943). *S. adocetus* is common in the Río Balsas basin of Michoacán, Guerrero, and Jalisco (Villa R., 1942; Villa-Ramírez et al., 1991), and in the arid tropics of Michoacán (Hall and Villa R., 1949).

Compared with *S. annulatus*, *S. adocetus* occupies a more arid area farther from the coast. The ranges of the two nearly meet and possibly overlap in northern Guerrero (Howell, 1938). In the valley of the Río Apaste, Jalisco, *S. adocetus* occurs with *Marmosa canescens*, *Sylvilagus cunicularis*, *Sciurus aureogaster*, *Liomys pictus*, *Pappogeomys tylosinus*, *Orthogeomys grandis*, *Osgoodomys banderanus*, and *Hodomys alleni* (Genoways and Jones, 1973).

In Guerrero, one nest of the lesser tropical ground squirrel contained numerous ectoparasites, including fleas (Siphonaptera), ticks (Acarina), and mites (Acarina—Villa R., 1943). The only ectoparasite reported from *S. adocetus* is the louse *Neohaemaphysalis traubi* (Ferris, 1951). No endoparasites are known.

**BEHAVIOR.** Groups of two to four (Villa R., 1942) lesser tropical ground squirrels may be seen running about at any hour of the day, but they are most active at 0900–1100 h (Howell, 1938). In December, *S. adocetus* is active aboveground from dawn to dusk, but is not as active in August (Villa R., 1942, 1943). Because there is more food available in winter than in spring, the lesser tropical ground squirrel may aestivate in the warmest months (Villa R., 1943).

Near ranch houses *S. adocetus* becomes quite tame and often approaches to within a few meters of the doors after scraps of food are thrown out by the human inhabitants. In the fields and scattered woods where it occurs, the lesser tropical ground squirrel is rather shy and retreats to its burrow at the first sight of a human or other cause for alarm. *S. adocetus* was abundant at a ranch near La Huacana, Michoacán, and was especially numerous along the stone walls bordering the trail near the ranch of Agua Blanca and in the old lava beds extending away from the south base of the volcano of Jorullo. In the morning as the sun was beginning to warm at Agua Blanca, dozens of these squirrels were scampering along the trail, sometimes pursuing one another or sitting up to look about. As humans approached, the lesser tropical ground squirrels ran to the stone walls and either sat on the top or took refuge in the crevices, and with heads projecting from the holes they watched the humans pass. Now and then one would scurry away to a hole under a stone or at the foot of a tree or bush. The habits of *S. adocetus* here were similar to those of *S. annulatus* along the stone-walled roads near the city of Colima, Colima. At the ranch near La Huacana, this species was living mainly in holes under rocks or bushes, but some also lived in stone walls. Wherever it occurs along roads, *S. adocetus* has become habituated to humans and is less shy than in less frequented places (Howell, 1938).

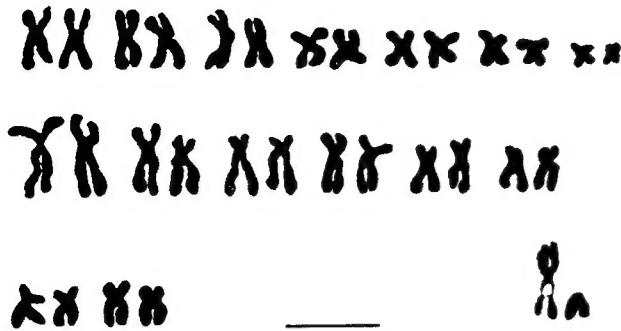


FIG. 7. Karyotype of a male *Spermophilus a. adocetus* from Xalitla, Guerrero, Mexico. The line represents 10  $\mu$ m (Birney and Genoways, 1973).

*Spermophilus adocetus* has a sharp chirping call note (Howell, 1938). As the sun came up in mid-April in Guerrero, the sharp and penetrating calls of these squirrels were heard everywhere at irregular intervals (Villa R., 1943).

Lesser tropical ground squirrels are active among rocks, in trees, and at the foot of *Crescentia alata*. They run and chase each other, and males may claim females or challenge other males. In the episodes of pursuit, the color of the pelage of the tail is prominent, as it is when the squirrel sits holding food with the forefeet and with the body arched (Villa R., 1943).

Fruits of plum trees and seeds of other plants are held with the forefeet. The incisors are used to open the seeds and to section the fruits. When the seeds or the pieces of fruit are prepared, the lesser tropical ground squirrel shoves them, with the thumbs of both forefeet, into the internal cheekpouches. When the cheekpouches are full, the animal caches the food. Caching occurs as the heat of the sun becomes intense. At 1100 h, lesser tropical ground squirrels may be active outside of the burrow near ponds of water in arroyos, involved in courtship, or active among the rocks where they find shelter. Later in the day, none are active aboveground. Inside the burrows, seeds that were cached are opened during the heat of the day (Villa R., 1943).

In captivity, one lesser tropical ground squirrel did not always cache food, e.g., when offered a banana it ate it right away, but seeds of pumpkin (*Curcubita pepo*) or corn were cached. This *S. adocetus* filled its cheekpouches with seeds at about the same rate as individuals in the wild, then it placed the seeds in a clay pot, which served as its burrow. Some nights at ca. 2200–0100 h, the ground squirrel could be heard eating the cached food (Villa R., 1943).

**GENETICS.** The karyotype of the lesser tropical ground squirrel (Fig. 7) consists of 32 chromosomes that can be divided into seven pair of metacentric and eight pair of submetacentric elements with a large metacentric and a small acrocentric element remaining as the heteromorphic pair. The latter two elements are thought to be the X and Y chromosome. The fundamental number of autosomal arms is 60 (Birney and Genoways, 1973).

**REMARKS.** *Spermophilus* is derived from the Greek *sperma* and *philos* meaning seed loving. The specific epithet *adocetus* is from the Greek *adoketos* meaning unexpected (Jaeger, 1955). *S. adocetus* also has been referred to as the plain-tailed spermophile (Elliot, 1905), and in Spanish as cuiniqui, tarascan, and kuaraki (Hall and Villa R., 1949).

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